

BENCHTOP MICRO

Electron Spin Resonance Spectrometer



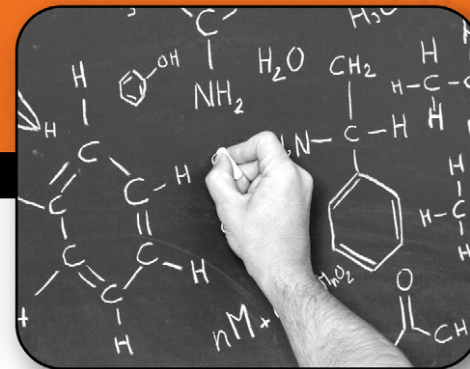
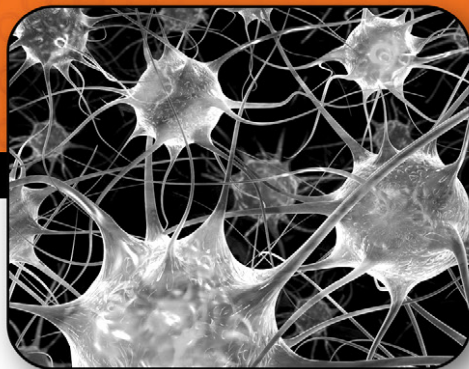
ONLINE

Electron Spin Resonance Spectrometer



ACTIVE SPECTRUM CATALOG

A complete line of benchtop ESR spectrometers, software, and accessories





ELECTRON SPIN RESONANCE (ESR/EPR) SPECTROMETERS

Benchtop ESR with Extended Range

Active Spectrum Introduces a new benchtop electron spin resonance (ESR/EPR) spectrometer with a field sweep of up to 6500 Gauss. ASI's new benchtop spectrometer operates at 9.7 GHz (X-Band) and full Windows 7 computer system with ethernet, multiple USB, and 802.11 WiFi. Lab-view acquisition control and data processing software are also included. Can be purchased with a number of different temperature control options.

Designed for the research market, the new benchtop ESR not only comes with an extended field sweep, but also increased sensitivity including aqueous and other polar samples. Very competitively priced.

Applications include, but are not limited to:

- Measuring Reactive Oxygen and Nitrogen Species
- Spin Labeling
- Spin Trapping (BMPO, DMPO, PBN, TEMPOL, PTIO, etc)
- Transition Metals
- Kinetics
- Free Radical Reaction Mechanisms
- Crystal Defects
- Vanadium in Crude Oil and Asphaltenes

SPECIFICATIONS

FREQUENCY	9.6 to 9.8 GHz
Resonator	Cylindrical Dielectric
Sample Tube Diameter	Up to 5.8 mm
Sweep Range	Up to 7000 Gauss
Supply Voltage	120/240 VAC
Data Interfaces	Ethernet, USB, and 802.11 WiFi
Screen	21 cm Touch Panel display with Windows 7 Embedded DVI/HDMI/VGA
Dimensions	34 x 36 x 56 cm ³
Mass	71 kg

SAMPLE RESULTS:

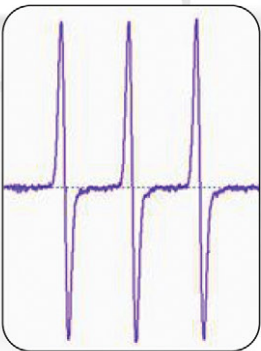


Figure 1:
50 µM aqueous TEMPOL
in 1 scan, 1 mm capillary
Limit of Detection:
40 nM in PBS

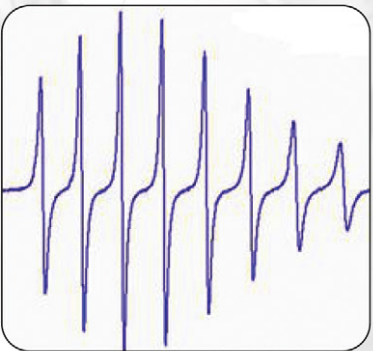


Figure 2:
VO(acac)₂

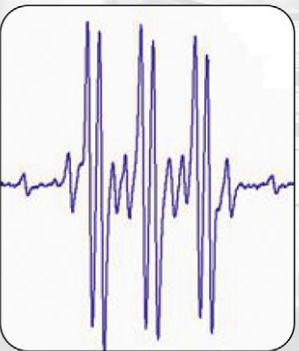


Figure 3:
PBN-DMSO-OH
Spin Adduct



BENCHTOP MICRO-ESR

Active Spectrum introduces the world's smallest Benchtop Electron spin Resonance (ESR/EPR) spectrometer.

Scientific research, education, and industry applications of electron spin resonance are now extraordinarily cost-effective.

ASI's Benchtop Micro-ESR includes our patented miniature electron spin resonance spectrometer operating at 9.7 GHz with a sweep range of over 300 Gauss and sub-micromolar sensitivity. Also included are an automatic temperature controller and full Windows 7 computer system with ethernet and multiple USB ports

The spectrometer can be purchased with a number of variable temperature control options.

Active Spectrum's portable Benchtop Micro-ESR has applications in research, education, and industry. Easily Transported to any Site: Plug In, Power On, Acquire Spectra.

Applications include, but are not limited to:

- Measuring Reactive Oxygen and Nitrogen Species
- Spin Labeling
- Spin Trapping (BMPO, DMPO, PBN, TEMPOL, PTIO, etc)
- Crude Oil: Asphaltenes and Vanadium
- Kinetics
- Education
- DNP
- Dosimetry
- Monitor the Thermo-oxidative Breakdown of Lubricants
- Shelf Life of Food Products
- Soot and Carbon Black

SPECIFICATIONS

FREQUENCY	9.6 to 9.8 GHz
Resonator	Cylindrical Dielectric
Sample Tube Diameter	Up to 5.8 mm
Sweep Range	Over 500 Gauss, centered at g=2
Supply Voltage	15 VDC (120/240 V Wall Adapter Included)
Data Interfaces	Ethernet and USB
Screen	21 cm Touch Panel display with Windows 7 Embedded DVI/HDMI/VGA
Dimensions	30.5 x 30.5 x 30.5 cm ³
Mass	10 kg

SAMPLE RESULTS:

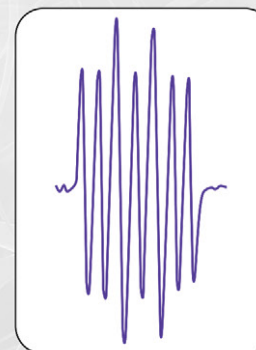


Figure 1:
PTIO-NO• Spin Adduct

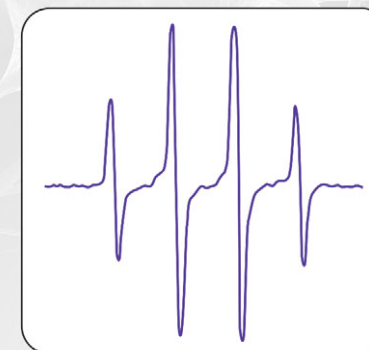


Figure 2:
DMPO-OH• Spin Adduct

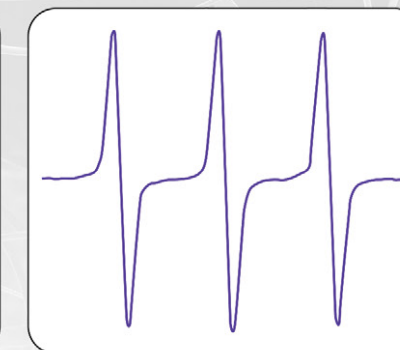


Figure 3:
50 μM aqueous TEMPOL in 1 mm capillary
Detection Limit: 0.1 μM in aqueous solution



ONLINE BENCHTOP ESR SPECTROMETER

Active Spectrum’s on-line Micro-ESR sensor is the world’s first industrial process monitoring instrument that provides real-time, embedded, non-destructive measurement of free radicals and some transition metals.

Designed to work under harsh environmental conditions, this spectrometer can operate in both flow mode and tube mode. Easily transported to any site. Can be ordered with custom fittings. Hazardous location rated enclosures available (Class I, Div. I, and ATEX).

Suitable for many applications not only in the field, but in research labs as well:

- Measure and Monitor Process Additives in all Hydrocarbon Matrices
- Measure Heavy Fuel Oils (HFOs) and Marine Lubricants
- Corrosion Products Such as Iron Oxides, Fe²⁺, and Cu²⁺
- Crude Oil: Asphaltenes and Vanadium
- Kinetics
- Spin Trapping (BMPO, DMPO, PBN, TEMPOL, PTIO, etc)
- Free Radical Reaction Mechanisms
- DNP
- Soot and Carbon Black
- Monitor the Thermo-oxidative Breakdown of Lubricants

SPECIFICATIONS

FREQUENCY	9.6 to 9.8 GHz
Resonator	Cylindrical Dielectric
Sample Diameter (Flow Mode)	Up to 6 mm OD
Sample Diameter (Tube Mode)	Up to 3 mm
Sweep Range	Over 500 Gauss, centered at g=2
Supply Voltage	15 VDC (120/240 V Wall Adapter Included)
Maximum Pressure	100 psi
Maximum Fluid Inlet Temperature	160° C
Operating Temperature	-30 to 85° C
Data Interfaces	USB and Interfaces with any Windows 7 PC
Dimensions	30.5 x 15 x 23 cm ³
Mass	10 kg

SAMPLE RESULTS:

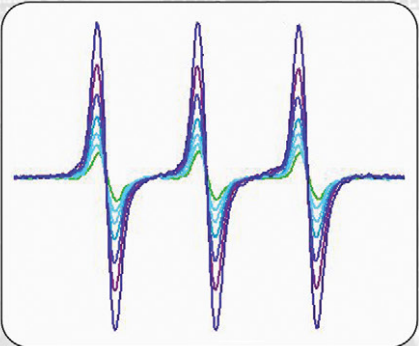


Figure 1: Monitor nitroxide or other free radical signals in real time in refineries, polymerization reactions, chemical processes and other applications.

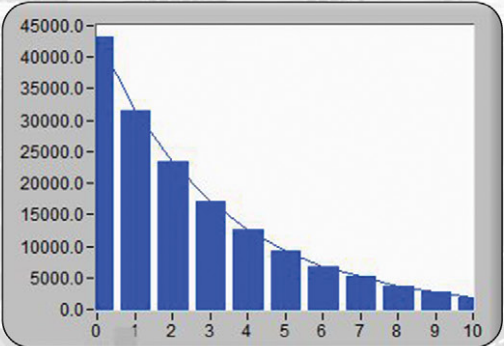
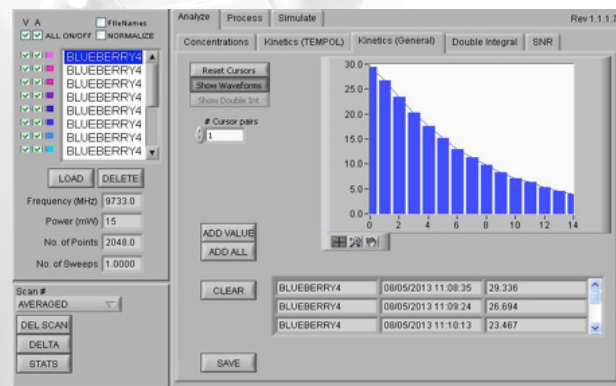


Figure 2: Rapid and repeatable quantification of radical signals as a function of time.

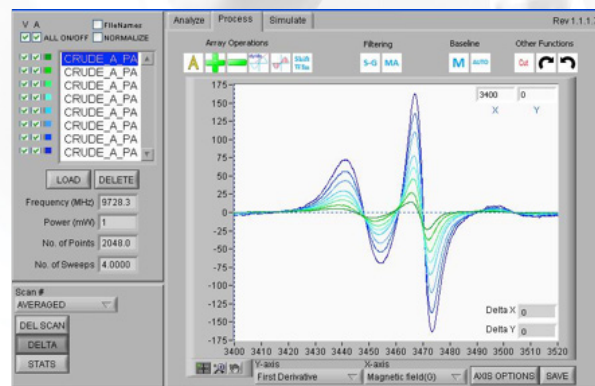
OPTIONAL PACKAGES

Processing and Analysis Software

- **Runs on any Windows computer**
- **User friendly in-depth processing and analysis of data**
- **Comes with detailed, printed manual**
- **Functions:**
 - Baseline correction
 - Filtering
 - Signal to Noise (signal amplitude/2*RMS noise)
 - Automatic Concentration Determination- can use either peak to peak amplitude or double integral values
 - Automatic processing of kinetics data
 - Automatic analysis of power array data
 - Calculation of double integral values



Display of Kinetics Data



Display of Power Array Data

Micro-ESR Education Package

A complete package to teach undergraduate chemistry students about magnetic resonance spectroscopy using Active Spectrum's Micro-ESR. The package contains seven experiments. The experiments are all stand-alone with the exception of the first lab which introduces the students to the spectrometer and gives them hands-on experience using the Micro-ESR. The experiments in this package were designed for first or second year chemistry students. None of the experiments, as written, assumes the students have experience with either quantum mechanics or advanced mathematics. Most of the experiments can be easily modified to use in p-chem lab, and some are ideally suited for p-chem.

The package contains the following:

- Micro-ESR Spectrometer
- Micro-ESR Experiments Manual with Seven Labs
- Micro-ESR Instructor's Guide
- Lab Accessory Kit
- Micro-ESR User's Manual
- Micro-ESR Analysis and Processing Software with Manual

Fiber-Optic Package

A fiber optic cable can easily be installed in the Micro-ESR either in the factory, or out in the field if the fiber-optic package is purchased separately from the spectrometer.

The package contains the following:

- A fiber-optic cable which can be installed inside the spectrometer
- Custom fittings to secure the cable
- SMA-SMA bulkhead fiber optic coupler for Spectrometer Housing
- SMA-SMA external adapter cable (from spectrometer to light source)
- Installation manual
- **Optional**- light source. Specify frequency.

External Reference Standard

An Mn(II) standard can be installed in the resonator cavity as an external reference.

ACCESSORIES

Variable Temperature Control

77 K

- Liquid nitrogen quartz dewar. Custom made for ASI by Wilmad-Labglass
- Requires liquid nitrogen
- 20 capillaries
- Most cost-effective

ESR Connection Kit for commercially available chiller/heaters.

Custom fittings for both Micro and Extended Range benchtop ESR spectrometers. Will work with multiple commercially available heating/cooling units. Allows for a thermocouple to be inserted just below the sample cavity.

Fixtures

Tube Alignment Guides

- For 5 mm tubes (included with spectrometer)
- For 4mm tubes
- For 2.3 mm tubes
- For 2.0 mm tubes
- For rectangular flat cells
- Custom sizes

Rotation Stages

- Automatic
- Manual

Reagents

BMPO (5-tert-butoxycarbonyl-5-methyl-1-pyrroline-N-oxide)

- 50 mg vials
- >99% pure, sealed under argon

Consumables

ESR Tubes

- Glass flat cells- 5 mm x 0.5 mm, for polar solvents
- 1.7 mm capillary
 - 100 mm length
 - 230 mm length
- 2 mm quartz capillaries, 100 mm
- 2.3 mm capillaries with O-rings, 100 mm
- 5.8 mm tubes with O-rings
- 5.0 mm quartz sample tubes
 - 100 mm length
 - 230 mm length
- 4.0 mm quartz sample tubes
 - 100 mm length
 - 230 mm length
- Precision quartz tubes
 - Thin-walled
 - Medium -walled
 - Thick-walled
- Quartz flat cell for polar solvents
- Custom flow-through quartz flat cell per customer specifications

Custom Reagents on Request.

Blunt Loading Needles

- 12 gauge- Ideal for transferring viscous liquids, including crude oil, into ESR sample tubes
- 20 gauge- Fit into even 1 mm ID sample tubes. Perfect for loading non-capillary action narrow ESR tubes

Calibration Standards

- Calibration Standard # 1- Mn(II) impurity in CaO
- Calibration Standard #2- DPPH in arabinose
- Calibration Standard #3- $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
- Calibration Standard #4- 50 μM TEMPOL in water

Other

- Installation and Commissioning (optional)
- Custom product development
- Application specific hardware and software



ACTIVE SPECTRUM CATALOG

A complete line of benchtop ESR spectrometers, software, and accessories

1191 Chess Street, Suite F, Foster City, CA 94404 | (650) 212-2625 | www.activespectrum.com | sales@activespectrum.com

